Umow Lai

Sustainable Design Statement

University of Sydney Health Precinct Stage 1

Report No M.LOR-0118 SDS Rev D
Date 19 September 2017

engineering sustainable environments

REPORT AUTHORISATION

PROJECT: **SUSTAINABLE DESIGN STATEMENT**
UNIVERSITY OF SYDNEY HEALTH PRECINCT STAGE 1

REPORT NO: **M.LOR-0118 SDS REV D**

Date	Rev	Comment	Prepared by	Checked by	Authorised by
26-06-17	0	Preliminary Issue	SRE	EAS	EAC
4-07-2017	A	Updated to comments	SRE	EAS	DKU
7-07-2017	B	Adjusted Framework	SRE	EAS	DKU
31-08-2017	C	Solar PV layout updated	CAV	SRE	SRE
19-09-2017	D	Solar PV layout updated	CAV	SRE	SRE

Melbourne Office
Umow Lai Pty Ltd
L4, 10 Yarra Street
South Yarra VIC 3141
Australia
Tel: +61 3 9249 0288
Fax: + 61 3 9249 0299
Email: ulmelb@umowlai.com.au
Web: www.umowlai.com.au
ABN: 27 748 212 498

Sydney Office
Umow Lai Enginuity Pty Ltd
L7, 657 Pacific Highway
St Leonards NSW 2065
Australia
Tel: +61 2 9431 9431
Fax: +61 2 9437 3120
Email: ulsyd@umowlai.com.au
Web: www.umowlai.com.au
ABN: 99 150 174 782

Brisbane Office
Umow Lai Pty Ltd
L7, 200 Creek Street
Brisbane QLD 4000
Australia
Tel: +61 7 3917 8888
Fax: +61 7 3917 8887
Email: ulbris@umowlai.com.au
Web: www.umowlai.com.au
ABN: 91 142 668 773

EXECUTIVE SUMMARY

This report provides an overview of the proposed Health Precinct Stage 1 development at the University of Sydney Camperdown/Darlington Campus. It examines the potential for sustainability measures to be incorporated in to the project to achieve the planning scheme objectives.

As a result of the ESD initiatives discussed within this report, the Health Precinct Stage 1 development is expected to achieve a level of environmental sustainability consistent with the criteria required by the Secretary's Environmental Assessment Requirements (SEARSs) for State Significant Development (SSD) and Stage 1 (CIP) Consent Condition B26.

The sustainability measures implemented in the design aim to ensure that the development has enhanced energy efficiency, therefore minimising the associated greenhouse gas emissions. The design targets a reduction in potable water use and investigates the use of alternative water sources. The minimisation of waste going to landfill, and an increase in the rate of material reuse and recycling is also incorporated.

As detailed in this report, the building has demonstrated its ability to achieve the sustainability objectives regarding energy, water and waste efficiency to meet the SEARs requirements. The SEARs requirements for the project with respect to this report are detailed as follows:

- Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the development.
- Demonstrate that the development has been assessed against a suitably accredited rating scheme to meet industry best practice.
- Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.

Compliance with the second point above is demonstrated through the achievement of a Silver sustainability ambition level under the UoS Sustainability Framework. This report details the sustainability measures proposed to be implemented into the Health Precinct Stage 1 and which satisfy all SEARs requirements..

.

CONTENTS

1 INTRODUCTION

This report has been prepared to provide an overview of the proposed Ecologically Sustainable Development (ESD) design features incorporated into the design of the proposed Health Precinct Stage 1 at the University of Sydney. The report identifies how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) are incorporated into the project and to demonstrate compliance with the SEARs requirements and Stage 1 (CIP) Consent Condition B26.

The sustainability measures implemented in the design aim to ensure that the development has enhanced energy efficiency, a resultant reduction in greenhouse gas emissions, reduced potable water use as well as waste going to landfill, and an increase in the rate of material reuse and recycling.

incorporated in the design and ongoing operation phases of the development. As detailed in this report, the building has the preliminary design potential to achieve the sustainability objectives regarding energy, water and waste efficiency as set out in the SEARs requirements.

The report includes discussion on the passive design features, energy efficiency, indoor environment quality, water conservation, sustainable materials, transport, waste management and appropriate WSUD initiatives which are proposed to be incorporated into the development.

The various ESD design measures noted in this document will be further explored as the project design and construction progress.

1.1 THE DEVELOPMENT

The development site for the Health Precinct Stage 1 is located at the western side of the University of Sydney Camperdown Campus. The site is bordered by Royal Prince Alfred Hospital to the West and the University cricket ground to the North.

The image below shows the existing site and environs including the adjacent Royal Prince Alfred Hospital.

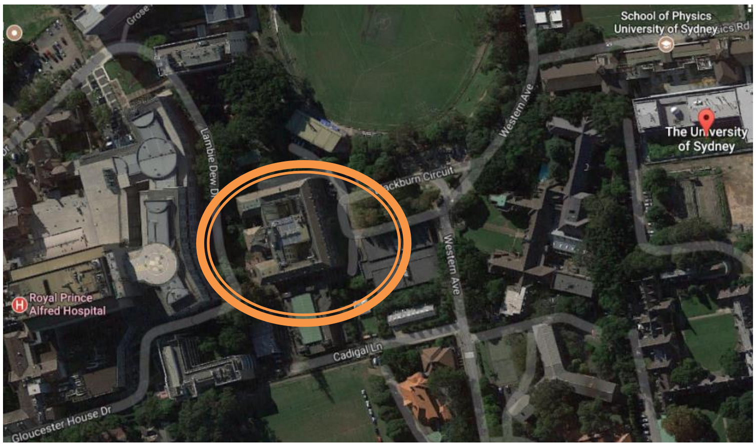


Figure 1: **Health Precinct Site** (image from Google Maps)

The development site lies within the jurisdiction of the City of Sydney. The teaching spaces are deemed to be Class 9b under the National Construction Code (NCC) 2016, office spaces are Class 5, with the car park area falling under Class 7a.

1.2 ECOLOGICALLY SUSTAINABLE DESIGN

The Intergovernmental Panel on Climate Change quotes that buildings are responsible for consuming 32% of the world's resources, including 12% of its fresh water and up to 40% of its energy, whilst generating 40% of the waste going to landfill and 40% of air emissions. Such figures confirm that buildings are the biggest source of emissions and energy consumption around the globe, and current design and construction practices in the built environment fuel the global slide towards irreversible climate change.

The property industry in Australia is well positioned to deliver significant long-term environmental and social improvements using a broad range of measures. This is realised with a focus on sustainability from an early stage of the design process.

Ecologically sustainable design of buildings seeks to minimise the ongoing operational consumption of scarce resources such as energy and water and to use resources in such a way as to minimise the impact on the environment. Within the building consideration is given to the amenity and comfort of the building occupants by appropriate selection of materials, fabric and energy systems.

2 REGULATORY COMPLIANCE

The following section details regulatory compliance requirements identified for the development related to sustainability.

2.1 Secretary's Environmental Assessment Requirements - SEARs

The SEARs requirements for the project with respect to this report are detailed as follows:

- Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) and Stage 1 (CIP) Consent Condition B26 will be incorporated in the design and ongoing operation phases of the development.
- Demonstrate that the development has been assessed against a suitably accredited rating scheme to meet industry best practice.
- Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy.

2.2 NCC Section J Energy Efficiency

Section J of the National Construction Code (NCC) stipulates the minimum energy efficiency requirements for residential (Class 1, 2, 3 & 4) and non-residential buildings (Class 5 to 9) within all states and territories of Australia where Section J has been mandated.

Section J is comprised of eight parts, each specifically outlining minimum deemed-to-satisfy criteria. Those sections that are applicable within New South Wales cover the performance of the building fabric, glazing, building sealing, HVAC systems, artificial lighting and power and access for maintenance.

Compliance with these requirements is ensured by the design team, and must be demonstrated before being approved for a building permit.

For Class 9b and Class 5 areas, compliance is demonstrated via the Deemed-to-Satisfy requirements of Part J1 to J3 (where applicable) or performance verification (JV3 modelling).

The Health Precinct Stage 1 project is proposing to exceed the minimum NCC Part J energy requirements by at least 20%.

3 UOS SUSTAINABILITY FRAMEWORK

The University of Sydney has developed its own sustainability rating scheme for buildings, known as the Sustainability Framework. The Sustainability framework has been developed specific to the University with reference to best practice building environmental rating schemes from Australia and around the world.

Within the Sustainability Framework individual measures detail specific design and infrastructure requirements to enhance sustainability of the project. Measures are grouped into the following categories within the framework:

1. Place making and Landscape
2. Leadership, Communication and Community Benefit
3. Healthy Environment
4. Resource Efficiency
5. Materials
6. Climate change and Infrastructure

Each sustainability measure is awarded a number of points, proportional to the sustainability benefit delivered by it. Most initiatives are awarded one, two or three points, but specific measures that provide a high level of operational savings and broader sustainability benefits are awarded higher points.

The Sustainability Framework benchmarks sustainability across different building types by using common sustainability ambition levels. There are four ambition levels available:

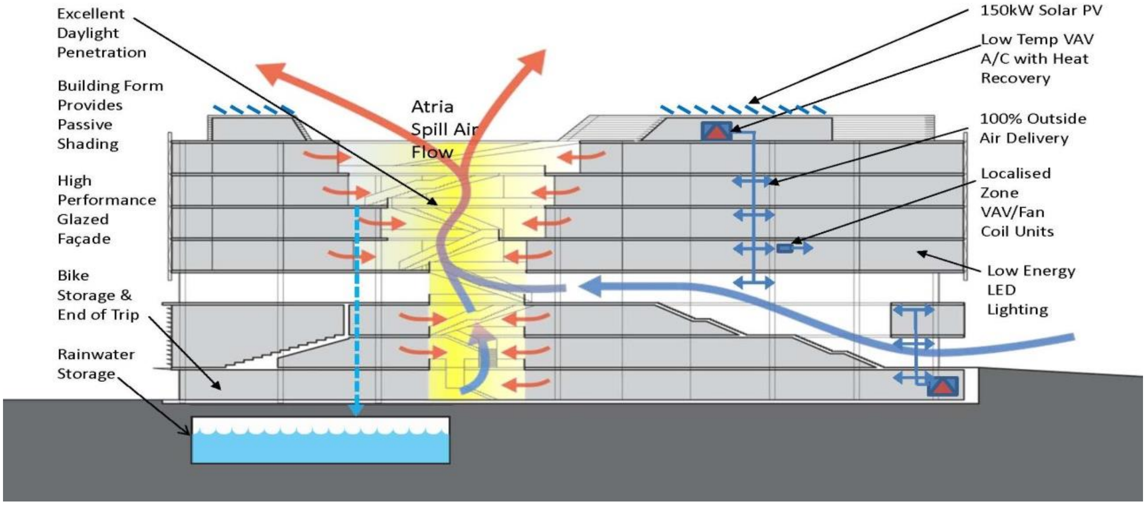
- Bronze – corresponds to 65-69% of the total points available
- Silver – corresponds to 70-74% of the total points available
- Gold – corresponds to 75-79% of the total points available
- Platinum – corresponds to >80% of the total points available

It is understood that the Sustainability Framework meets the SSDA and SEARs requirements as a suitably accredited rating scheme to meet industry best practice.

The detailed credits being claimed by the Health Precinct Stage 1 project under the Sustainability Framework are detailed in Appendix A at the end of this report. The framework sustainability ambition level currently being met by the project is a Silver rating as a minimum with an optional pathway to Gold. However it should be noted that a significant proportion (10.7%) of the framework score is currently dedicated to mixed mode and natural ventilation related credits. The project is currently seeking clarification on the application of these credits, as the University has instructed that mixed mode natural ventilation is not to be used throughout the project. If these credits are excluded then the Health Precinct Stage 1 project would currently be targeting at least a Gold sustainability ambition level with the potential to achieve Platinum. The current minimum commitment is a Silver Ambition level under the framework.

4 SUSTAINABILITY INITIATIVES

The subsequent sections set out the important ESD design features of the new development, that contribute to it meeting the SEARs requirements. Key sustainability initiatives included in the design are summarised in the building cross section image below.



4.1 GENERAL ESD DESIGN APPROACH

The overall Sustainability objectives and approach for the Health Precinct Stage 1 development are as follows:

- To create buildings that actively facilitates staff and student wellbeing through sustainable design and management;
- To provide an internal environment quality that encourages an effective and collaborative staff and student learning environment;
- To provide substantial reductions in energy consumption and greenhouse gas emissions with a focus on passive building design, energy efficient services, operational energy management and the use of renewable energy;
- To minimise potable water use and environmental impacts through water conservation, rainwater recycling and water sensitive urban design; and,
- To minimise resource use through the sustainable selection of materials, waste reduction and recycling.

4.1.1 Massing

The starting point for sustainable building design is to provide an orientation and massing for the building that seeks to limit harmful solar exposure to the extent that the site allows, while providing good indoor environment quality. Passive solar design principles are employed to reduce solar exposure from the massing of the building through to the design of individual facades.

The orientation and massing of Health Precinct Stage 1 is largely defined by the site orientation. The site location is surrounded by a number of existing buildings, particularly to the west, which will aide in reducing some afternoon low angle solar loads to the lower levels. The relatively small foot print, central core and atria design of the upper levels of the building will mean that the majority of spaces will have direct access to the façade. Overall the precinct has been designed to encourage sun penetration into terrace areas and external landscaped areas while limiting the impacts of solar radiation on internal spaces.

Details of the facade design have been provided within the architectural documentation. The facade will incorporate high performance glazing with areas of external shading to provide excellent solar control and visual light transmission properties. Additional analysis will be conducted in subsequent design stages to confirm that the facade performance will exceed current energy efficiency code requirements.

4.1.2 Building Fabric

In order to reduce the energy consumption associated with active heating and cooling systems, the development will incorporate sufficient levels of insulation to provide a high performing building fabric.

A good performance building fabric is highly relevant for a University development in Sydney's climate. Space conditioning will occur for extensive hours through the day (to varying extent throughout the building). A good performance building fabric which meets and/or exceeds minimum NCC requirements can significantly impact the heating and cooling energy consumption associated with the facility.

The levels of insulation to be incorporated within the building fabric will be selected to meet or exceed the requirements of the NCC Section J. Typically, these will be as follows:

Table 1 *Building Fabric Insulation Performance*

Building Fabric Component	***Recommended Insulation Level (Total System R-value)***
Exposed Ceilings/Roof	R3.2
Exposed Exterior Walls	R2.8
Exposed Suspended Floors	R2.0
Walls between conditioned and unconditioned spaces	R1.8
Floors between conditioned and unconditioned spaces	R1.0

Insulation is the most effective and economical method of improving a building's fabric performance; hence the minimum insulation levels for Sydney have been met and exceeding this performance will be further investigated during detailed design.

The thermal performance of glazing has also been optimised in order to minimise heat transfer along with the selection of glass with a low Solar Heat Gain Coefficient. Glazed sections will be complemented by insulated spandrel panels to reduce overall solar gain and resulting air conditioning energy consumption.

Table 2 *Typical Glazing Performance*

	Recommended Performance (Total System U-value)
Total System U-value	≤ 2.5 W/m^{2}K
Total System SHGC	≤ 0.3
Glass Only U-value	≤ 1.8 W/m^{2}K

4.2 CONSTRUCTION, OPERATION AND WASTE MANAGEMENT INITIATIVES

The Project Team understands the importance of not just designing ESD principles, but the necessity to carefully manage the ESD elements of the project from inception to beyond completion into operation.

Important elements of the management of the building to optimise the ESD benefits to the project are as follows:

4.2.1 Commissioning

Comprehensive building pre-commissioning, commissioning and quality monitoring will be required by the appropriate contractors and trades on site.

Transfer of all documentation regarding design intent, as-installed details, commissioning report and training of building management staff to the Building Owner/Manager.

4.2.2 Services & Maintainability Review

Reviews will be conducted for commission-ability, controllability, maintainability, operability (fitness for purpose) and safety. This will be conducted for base-building and fitout services by University of Sydney Campus Infrastructure Services facility management staff who have an intimate knowledge of the facility requirements.

4.2.3 Building Users Guide

To enable the building users to achieve the environmental performance envisaged by the Design Team, a comprehensive Building Users Guide will be prepared for use by the tenants of the building. Building operations and maintenance information will be required to be provided by the Contractor.

4.2.4 Construction Management

In order to minimise environmental impact during construction, the d will be required to provide and implement a comprehensive Environmental Management Plan (EMP) during the construction works.

In addition, the Contractor will be required to maintain an ISO 14001 Environmental Management System throughout the construction of the building, and recycle a target amount of waste.

4.2.5 Specialist ESD Advice

A specialist Sustainability Consultant (Umow Lai) with extensive experience in the design of World Leading sustainable university facilities is employed to advise the project through the design, construction and initial operational phases of the project.

4.2.6 Sub-Metering

Appropriate sub-metering will be provided to enable effective management and monitoring of water and energy use in the new facility.

4.2.7 Construction Waste Management

The Contractor will be required to implement and maintain a Waste Management System throughout the construction of the building. This plan will monitor and measure waste materials leaving site and determine the amount of waste material able to be recycled away from land fill. A waste recycling target will be mandated, provisionally set at a minimum of 85% of waste by weight.

4.2.8 Operational Waste Management Plan

An operational waste management plan has been developed and will be implemented as part of the ongoing management of the building.

During operation, the waste management infrastructure will enable co-mingled recycling of the main recyclable waste streams along with specific recycling of electronics, batteries and light fittings.

4.2.9 Building Information

Abuilding Users Guide will be prepared and distributed to occupants of the building to communicate environmental features and educate users in the effective operation of the facility.

A building information display will communicate important sustainability initiatives and to users of the facility for ongoing feedback and education.

4.3 HEALTHY ENVIRONMENT

4.3.1 Indoor Air Quality

To improve the IAQ, the minimum outside air rate provided to the HVAC systems will exceed the AS1668.2 requirements. A key initiative to deliver high quality indoor air quality will be the provision of outside air rates typically in excess of minimum requirements. Several areas of the building including office levels will be provided with single pass 100% outside air supplies through the use of air to air heat exchangers.

High efficiency air filtration will be provided to air handling and fan coil units to further enhance indoor air quality.

An indoor air quality plan will be developed and followed through the construction and operation of the building to maintain a high level of indoor air quality.

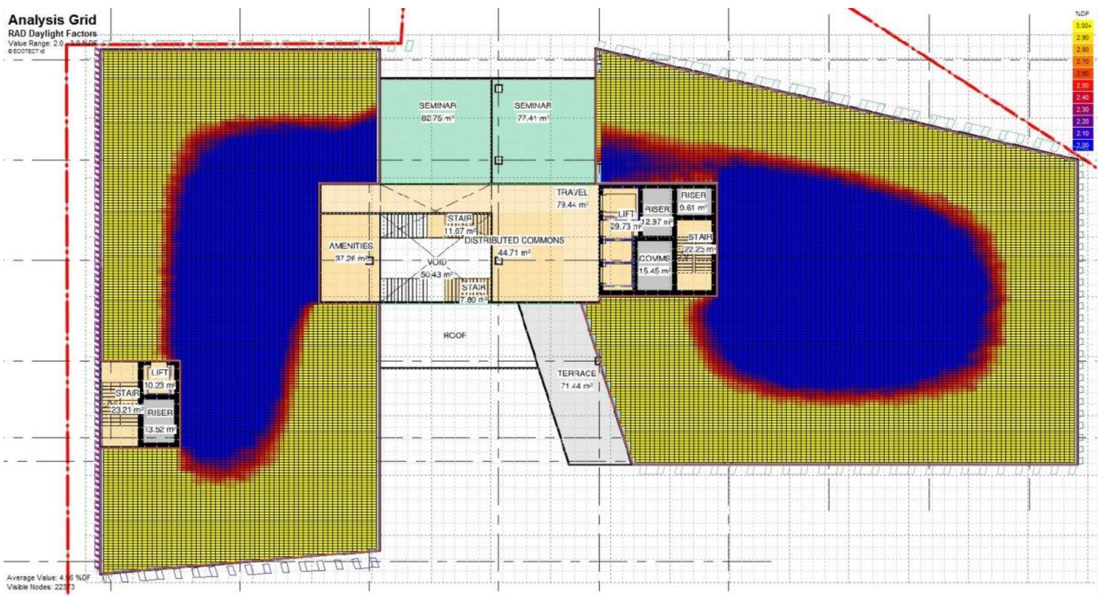
4.3.2 Daylight

Daylight not only provides an opportunity for reduced lighting energy consumption (in conjunction with appropriate lighting controls), but also has many psychological and physiological effects on building occupants, and provides the most appropriate environment for colour recognition and visual comfort. Hence, daylight is one of the key passive design features in the development.

Sufficient daylighting has been ensured through the following design measures:

- Provision of adequate glazing, in terms of size, visual light transmission and placement of windows in relation to the building's depth of floor plate;
- Selection of glazing that allows for:
  - Minimised solar heat gain in summer while allowing some passive gains in winter (SHGC);
  - Minimised heat transfer through transparent and opaque elements (U-value);
  - Maximised visible light transmittance (VLT) while optimising the SHGC and U-value.
- Selection of adequate fabric materials and colours for interiors fitouts.

The following image shows preliminary daylight modelling for an upper office level and demonstrates that a relatively large proportion of the floor plate will receive satisfactory levels of daylight.



4.3.3 Lighting

The lighting will be carefully designed to optimise occupant comfort. Luminaires will be selected to avoid the low level flicker often associated with conventional fluorescent lighting.

High efficiency LED light fixtures will generally be preferred for general space lighting due to its very low energy use and long service life.

Surface illuminance in accordance with Australian Standards and localised control (through task lighting) will be provided where required.

4.3.4 Thermal Comfort

The good performance façade systems in conjunction with the air conditioning systems will be designed to ensure high thermal comfort conditions leading to greater occupant satisfaction and improved wellbeing.

The selection of HVAC system comprising fan coil units and LTVAV allows more localised zoning, thereby improving thermal comfort for occupants in each specific A/C zone.

4.3.5 Noise

Detailed design will be performed to ensure that the building services achieves ambient internal noise levels in accordance with AS/NZS 2107:2000, to ensure comfort of the building occupants..

4.3.6 Minimisation of Internal Air Pollutants

The materials used in the construction of the building will be specifically selected to minimise off-gassing of Volatile Organic Compounds (VOC) and Formaldehyde, which can impact on indoor air quality.

- All paints, sealants and adhesives used in the construction will be low-VOC paints
- Carpets will be specially selected to be low-VOC

It is proposed that only low formaldehyde composite wood products will be utilised

4.4 Resource Efficiency - Energy

4.4.1 Building Fabric

The composition of the building fabric will be tuned to respond to both the external and internal environmental loads.

Significant extents of high performance glazing are proposed with low solar and thermal energy transmission but relatively high visible light transmission. External shading has been proposed across large areas of the façade to limit the amount of solar radiation entering the building.

The overall approach to the building façade design provides a very efficient platform for the building's low energy performance.

4.4.2 Energy Efficient Air Conditioning Design

The design for the building will incorporate energy efficient air conditioning systems which are capable of achieving reduced greenhouse gas emissions. The majority of the air conditioned spaces in the lower teaching levels of the building are proposed to be conditioned using localised fan coil units, each comprising filters, cooling and heating coils and a supply air fan. Such localised systems offer dramatically reduced fan energy consumption compared to centrally reticulated air handling systems. Control systems will also be used to reduce air conditioning energy in unoccupied spaces. CO2 sensor controls will be used to modulate air conditioning outside air intake flow rates to match actual occupancy requirements.

Office areas on the upper levels will be air conditioned with low temperature variable air volume (LTVAV) systems with outdoor air heat recovery. The large lecture theatres on Levels 1 and 2 will each be served by a dedicated air handling unit supplying conditioned air at floor level beneath the tiered seating (displacement ventilation). The outdoor air rate to each air handler will be modulated by CO2 sensors in the respective theatres that will track the occupancy level.

Electricity consumption will be further reduced through the selection of highly efficient plant and equipment, particularly, fans and pumps.

All HVAC major plant selected will be high efficiency including:

- Energy efficient central chilled water plant located on the roof will supply all cooling to regularly occupied areas of the building.
- All electric motors will be high efficiency. Variable speed fan and pumping motors will be used in many instances that are suitably sized to maintain efficient operation across the full range of energy requirements for each building system. This will ensure efficient operation in all seasons and at all likely occupation rates.
- High efficiency pumping systems.
- Plant energy use will be monitored and optimised using the Building Management System (BMS).

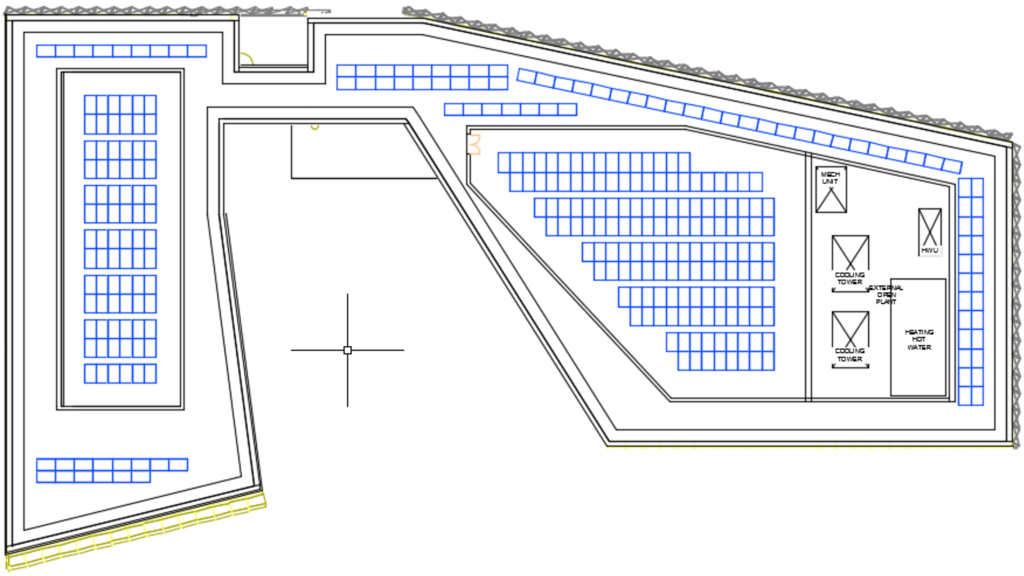
4.4.3 Energy Management Controls

Controls can provide the means necessary to ensure that energy use is reduced, as well as providing linkages that allow for monitoring and management. A dedicated energy management system will be incorporated with the building control system to allow for the effective monitoring and tuning of building energy performance.

Each individual conditioned space zone will be provided with HVAC energy reduction measures that allow systems to be switched off systems not required.

4.4.4 Renewable Energy

In addition to solar DHW, additional renewable energy is proposed in the form of a significant Solar Photovoltaic (PV) array on the roof of the building. The PV system is notionally designed to achieve approximately 97.2 kW peak output, which is expected to be used to supply the building with minimal export. The following image shows a preliminary layout of the roof PV array.



4.4.5 Lighting

Artificial lighting is expected to consume a significant part of a building's electrical energy. The lighting design will focus on energy conservation through the use of low energy lighting and controls technologies.

Strategies that are proposed to reduce energy use for electric lighting are:

- Enhanced natural daylight levels (in line with thermal requirements) by providing relatively high visual light transmission glazing element areas and dimensions. Daylight dimming controls will be used in office areas receiving adequate daylight to reduce electric lighting energy consumption;
- High efficiency light fittings, including LED technology, to be used throughout the facility;
- Lighting for occupied spaces, common and public areas uses occupancy sensors and time clock controls to ensure lighting is not used when it is not required;
- Appropriately designed exterior lighting, with no direct light into the sky, complete with appropriate control systems (e.g. movement sensors, daylight sensors, time clocks etc)

4.4.6 Domestic Hot Water (DHW) System

Heat for domestic hot water will be sourced from the heating hot water central plant located at roof level of the Health Precinct. The central domestic hot water plant is also proposed to be connected to roof mounted solar thermal panels to provide base level heating. High efficiency condensing gas water heaters will provide additional energy as required.

4.4.7 Metering

All substantive energy uses within the building will be sub-metered. This will be linked through an energy monitoring system to allow trending of energy uses daily, weekly and annually. Commissioning and validation of the metering system will be undertaken.

4.5 Resource Efficiency - Water

Water conservation is of primary concern to this development. Measures to be employed include:

- The use of water efficient WELS rated fittings for taps, toilets, urinals and showers.
- Rainwater collection, treatment and recycling for landscape, toilet flushing and heat rejection.
- Landscaping is designed to be water sensitive.
- Water meters will be installed for all major water uses. These will be linked to the Building Management System to provide a leak detection system.
- Water Sensitive Urban Design measures are incorporated in addition to rainwater capture.

4.5.1 Rainwater

Rainwater is to be collected for various roof area catchments and conveyed to connect and discharge into a storage tank of adequate capacity to suit the balance between the catchment areas collected and the supply of treated rain water to flush toilets, feed air conditioning heat rejection and supply irrigation watering.

The collected drainage is to connect to the storage tank via a first flush management device to control and prevent debris and material entering the tank. Recycled water supply from the storage tank will pass through a filter system comprising bag filtration and UV disinfection. Overflow from the tank will connect to the stormwater drainage system and be conveyed to the point of discharge as detailed on the civil documents.

4.5.2 Water Conservation

The selection of fixtures, fittings and appliances will focus on water conservation to provide very low water consumption. The following table shows the preliminary flow rates considered for various fixtures to achieve the minimum water efficiency targets.

Table 3 *Water Efficiency Requirements*

Fittings	WELS Rating	Flow rate
Toilets – dual flush	4 Star	3/4.5 L/flush (ave. 3.6 L/min)
Taps –, common area amenities	6 Star	<5.0 L/min
Taps – handbasins	5 Star	<5.0 L/min
Taps – kitchens	5 Star	<6.0 L/min
Showerheads	3 Star – Band 2	<7.5 L/min

The use of low water consuming fixtures as outlined above in addition to rainwater reuse will provide improvements exceeding typical practice. As a result the project will achieve the SEARs objective to minimise mains potable water consumption.

4.5.3 Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) elements are incorporated into the design to reduce storm water peak flows and to reduce contaminant levels within water discharges. The project site contains the upper and lower Wakil Gardens which will be used in part to filter and retain rain water flows. Rain water falling on roof and terrace areas will be collected in a rain water storage tank and reused within the building, thereby reducing stormwater discharge flows.

The site also forms part of a significant over land flow of water across the campus. Part of the siting and design of the building is to manage these storm water flows by detaining a large water volume underneath the building during large stormwater events. Further treatment will be provided to water leaving this detention area through the use of filter media designed to remove specific harmful pollutants.

The following image depicts over land stormwater flows and detention areas within the proposed Health precinct Stage 1 site.

STAGE 1 - OVERLAND FLOW

4.6 TRANSPORT

4.6.1 Car Parking

The development includes only a limited number of car parks on with just 24 spaces provided on level 0. It is anticipated that the overall restricted nature of parking available on the site will still encourage patients, visitors and staff to utilise more sustainable forms of transport, such as public transport systems, which are readily accessible from the building.

4.6.2 Cyclist Facilities

The provision of cyclist facilities within the development promotes use of bicycles across the campus and for staff and students to use these as their primary means of access.

Bicycle spaces are proposed to be provided at level 0 in accordance with the University of Sydney Architectural Design standards. End of trip facilities including change rooms, lockers and showers are similarly proposed to be provided adjacent to the bicycle storage area.

Access to an exceptionally wide range of amenities, including the local bike path networks, are immediately accessible to the building.

4.6.3 Public Transport Access

The building is accessible for public transport being located within walking distance of Redfern, Macdonaldtown and Newton train stations. Bus services also operate nearby along Parramatta Road.

4.7 MATERIALS

4.7.1 Waste Reduction

In order to reduce waste, consideration will be given to selecting materials to be used in the building construction to have a significant recycled content.

4.7.2 Sustainable Materials Selection

Materials used in the project will be specified to minimise their embodied energy, ecological impact and resource depletion potential. This includes the selection of key materials such as PVC and timber. Selection of timber will generally be from sources that are either reused, recycled or through recognised environmental certification schemes. Similarly the majority of steel used in the building will be selected to provide a high recycled content.

4.7.3 Embodied Energy

Some modern building materials have very high embodied energy content. Life Cycle Assessment (LCA) is proposed to be used through the design process to assist in the selection of materials that will result in reduced embodied carbon, resource depletion and environmental impacts When choosing materials during the design process, consideration will be given to minimising the LCA impacts, in line with the following:

- Energy used in the manufacturing process of the material;
- Transport energy (sourcing local materials over interstate or imported materials);
- Materials with a recycled content (e.g. steel, concrete aggregates);
- Longevity of the completed product; and
- Ongoing maintenance requirements, or material durability.

Many of the materials have undergone Life Cycle Analysis calculations that provide a detailed analysis of the building's embodied energy and environmental impact. The selection of materials with favourable LCA benefits will be further considered during detailed design.

4.8 LAND USE & ECOLOGY

4.8.1 Re-use of Land

The site has been previously built on and is not of significant ecological value and as a result, the ecological value of the development site will not be diminished by the proposed building.

4.8.2 Heat Island Effect

Roof and surface treatments will be carefully considered to minimise contribution to the heat island effect.

4.9 EMISSIONS

4.9.1 Light Pollution

The design will endeavour to minimise light pollution in that no direct beam light will be directed beyond the site boundaries or upwards to the night sky.

4.9.2 Stormwater Management & Quality

Stormwater quantities from the site will be carefully managed appropriate treatment will be provided to achieve necessary stormwater quality objectives.

5 CONCLUSION

This report has demonstrates meets the Health Precinct Stage 1 development meets the SSDA submission SEARS requirements. These are in addition to the minimum compliance requirements of the NCC (i.e. Section J).

As a result of the ESD initiatives discussed within this report, the Health Precinct Stage 1 development is expected to achieve a level of environmental sustainability consistent with the SEARs requirements and Stage 1 (CIP) Consent Condition B26.

The sustainability measures implemented in the design aim to ensure that the development has enhanced energy efficiency, thus minimising the associated greenhouse gas emissions. Potable water use will be minimised through water conservation measures, including Water Sensitive Urban Design initiatives. The project also includes measures to minimises waste going to landfill through the construction and operational stages, while increasing the rate of material reuse and recycling.

As detailed in this ESD Statement, the Health Precinct Stage 1 development has demonstrated the design potential to achieve the SSDA submission SEARS requirements and Stage 1 (CIP) Consent Condition B26.

6 APPENDIX A - SUSTAINABILITY FRAMEWORK

The following details the extent of the University of Sydney Sustainability Framework credits being targeted by the Health Precinct Stage 1 development.